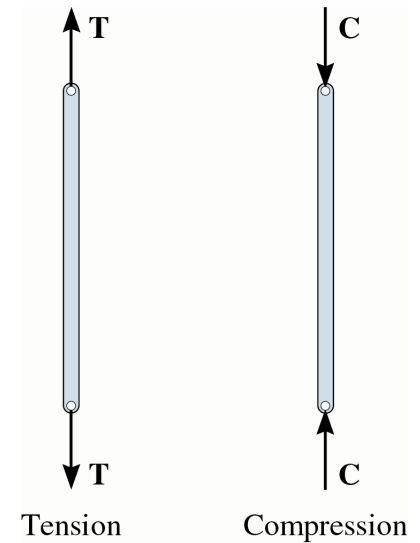
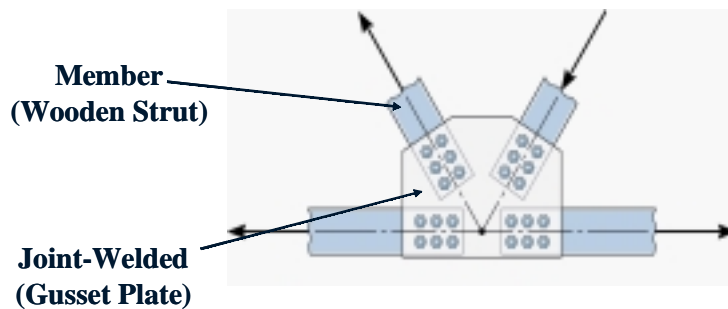


Simple trusses: Part 1

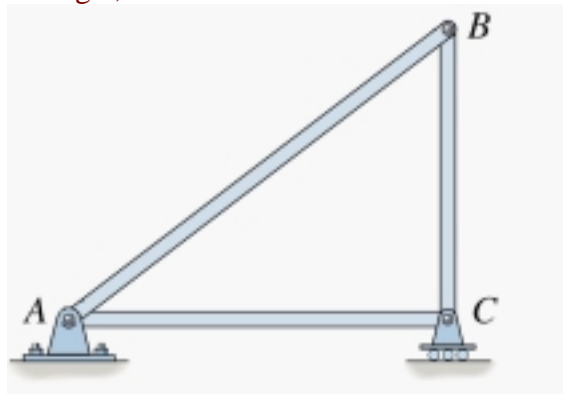
Planar trusses:

A **Truss** is a structure composed of slender members (**two-force members**) joined together at their end points. Joints are modeled by smooth pin connections. Members are either under tension or compression.

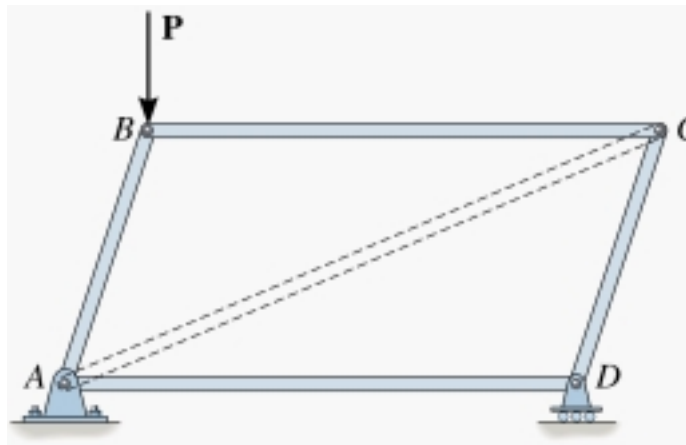
Joints are usually formed by bolting or welding the members to a common plate, called a **gusset plate**, or simply passing a large bolt through each member.



When all members of a truss lie in a single plane, that truss is **planar**. A plane truss is **rigid** if it does not change shape when subjected to a general system of forces at its joints. The truss must maintain its shape and remain a rigid body when detached from its supports. The simplest stable or rigid form of a truss is a **triangle**, which is the **basic truss element**:

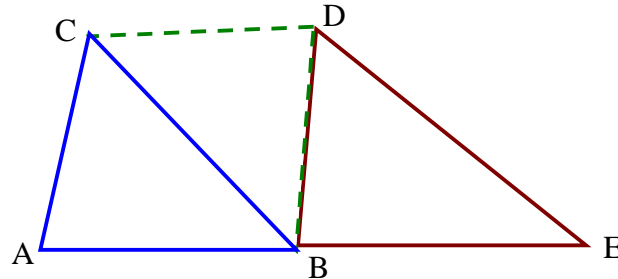


To prevent collapse, the form of the truss must be rigid. For example in the following figure, add member AC to stabilize the truss:



The basic truss ABC can be extended by adding new members BD and CD to the existing joints B and C and connecting them to form a new joint D. Providing that D does not lie on a line through BC the new truss will be rigid.

Further extend the basic truss by repeating this process. A truss constructed by this procedure is called a **simple truss**.



A simple truss is formed by taking the basic truss element and adding two members and one joint. If the number of joints is represented by j , the number of reaction forces by r , and the number of members by m , then the following formulas show which type of truss we have:

$m < 2j - r$ <i>Statically Unstable</i>
$m = 2j - r$ <i>Statically Determinate</i>
$m > 2j - r$ <i>Statically Indeterminate</i>

If a simple plane truss ($r=3$), is statically determinate, then:

$$m = 2j - 3$$

Examples:

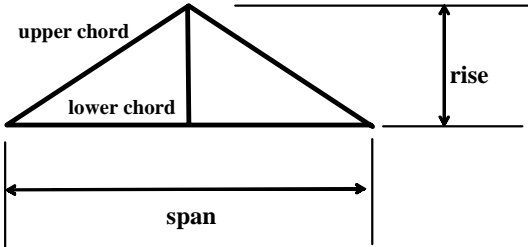
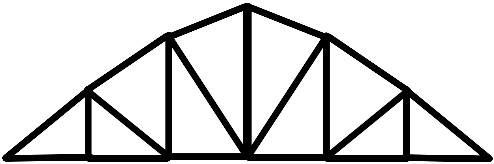
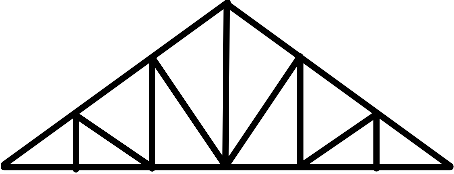
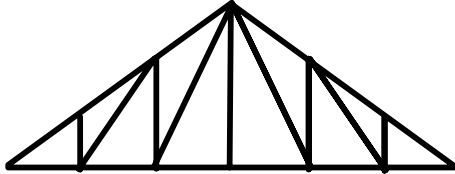



<p>Statically Determinate: $m = 7$ (members) $j = 5$ (connection joints) $r = 3$ (two for pin and one for roller) $m = 2j - r$</p>	
<p>Statically Indeterminate: $m = 8$ $j = 5$ $r = 3$ $m > 2j - r$</p>	
<p>Statically Indeterminate: $m = 6$ $j = 5$ $r = 3$ $m < 2j - r$</p>	

Type of trusses:

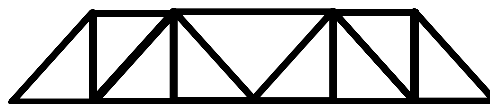
There are two types of trusses:

1. Roof trusses, and
2. Bridge trusses.

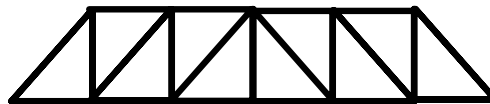
The following table shows various types of the roof trusses:

<i>Roof trusses</i>	<i>Bridge trusses</i>
 <p style="text-align: center;">King post</p>	 <p style="text-align: center;">Bowstring</p>
 <p style="text-align: center;">English or Howe</p>	 <p style="text-align: center;">Pratt</p>
 <p style="text-align: center;">Howe</p>	 <p style="text-align: center;">Pratt</p>
 <p style="text-align: center;">Warren</p>	

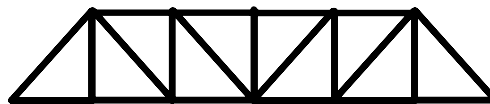
The following figures show some bridge trusses:



Warren



Howe



Pratt